

Do Sand Dunes Really Form a Barrier?

Level

8+

Key questions

What is the formation of dunes here? What primary colonisers grow on them? What happens to dunes if the vegetation goes? Can statements about the role of vegetated dunes be tested for their truth?

Key outcome

Using a questioning technique, develop understanding of the key role of vegetated sand dunes as a barrier along the coast against the action of waves and tides.

Adapted from field sheets of Beerwah Field Study Centre.

What each group needs

Diagrams as shown in Figure 1 with questions

Guide to grasses and beach plants

Long (30 m) tape measure and short (e.g. sewing measure of 1 m) tape or metre, thermometer, and pH kit per group

What each group does

Select an appropriate field site with vegetated foredunes, and parallel dunes behind a swale. Collect your equipment.

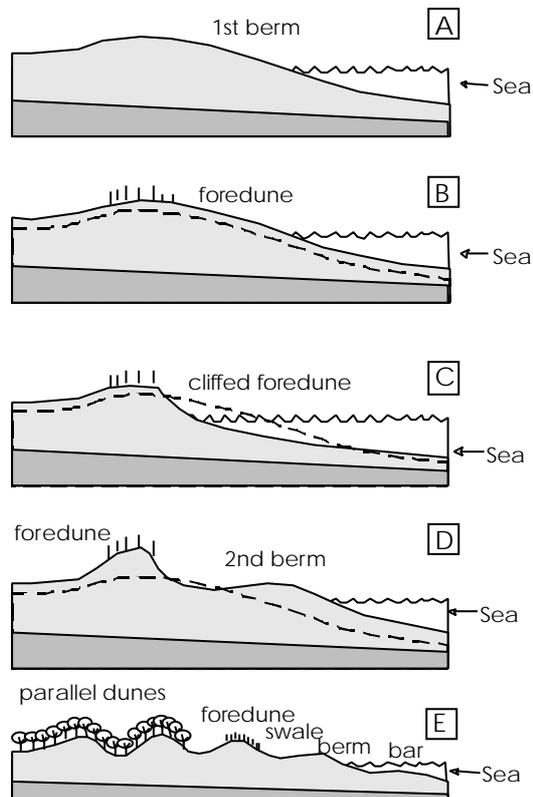
Field sheets

Figure 1 (A-E) shows the development of a succession of sand dunes along a beach. Figure 2 (A-D) shows the development of vegetation colonising those dunes.

1. Decide as a group which section of Figure 1 best shows your section of dunes.

You may decide that the dunes are at some inbetween stage. If so, sketch the formation. Outline the methods you used to reach your decision.

Figure 1. Stages in the formation of sand dunes



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2. Carry out a field survey of the vegetation on the dunes, moving from the beach to the main dunes (see accompanying data sheet).

Measure out a transect line using the tape measure of approximately 150 m. Every 30 m OR at the change of vegetation type carry out a quadrat study over one square metre. The one square metre is called a station. Examine the species in your quadrat. At each station, either count numbers or estimate the percentage cover of the quadrat, and record the information on a data sheet like the sample one at the end of this activity.

3. Discuss your results.

- What is the most common vegetation type?
- Where does this occur most frequently?
- Does the amount of bare sand vary as you move away from the beach?
- What effect does the wind appear to be having on the vegetation? Is there any sign of wind sheering (the vegetation grows at a slope – the trees bend over)?
- Is there sign of fresh water?
- Is the area used frequently by people or grazing animals? How do you know?
- Has there been any attempt to revegetate the dunes you are working on?

4. Now use a questioning technique. The following statements are quoted directly from a leaflet on sand dunes in a series entitled *Coastal Sand Dunes*, ‘The Formation and Function of Coastal Dunes’, published by the Beach Protection Authority of Queensland. Add a question mark after each statement. Now, consider your field results, the questions, and Figure 2 (see next page).

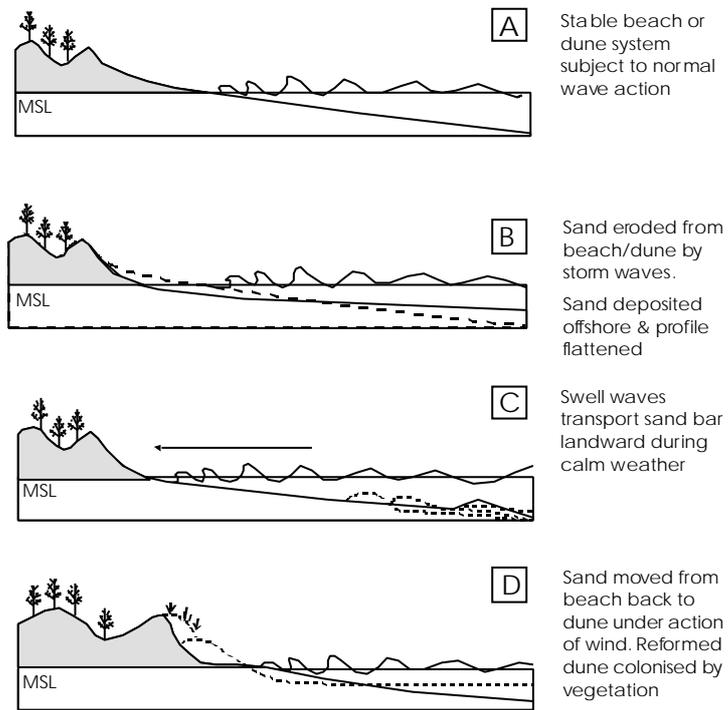
Can you prove that each statement is true? Which statements cannot be proven correct? Why? Do you need further information? Where would you get this information?

Statements to test:

- ‘Foredunes act as barriers against the action of waves and tides, and are a source of sand for the beach during periods of erosion’.
- ‘They protect areas behind them from wave damage and salt water intrusion during storms’.
- ‘Vegetated foredunes are inherently flexible (Figure 2, A-D)’.
- ‘If they are damaged by storm waves the remaining vegetation traps sand blown from the beach and the dune is reformed’.
- ‘Vegetated foredunes restrict wind, sand and salt spray intrusion into the hind dune areas’.
- ‘If landward parallel dunes are well stabilised, they serve as a second line of defence against erosion, should the foredune be destroyed by the action of storm waves’.

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Figure 2. Flexible behaviour of vegetated foredune and ocean beach subject to wave action (adapted from Wave & Barr, 1977)



Conclusion

As a group, reach a consensus decision. Which of the methods you used today to study the dunes gave you the most information? Which was the most interesting to do?

References

Leaflets on *Coastal Sand Dunes*, published by the Beach Protection Authority, Queensland Department of Environment, PO Box 155, Brisbane Albert Street, 4002.

Bird, E.C.F. (1972), *Coasts. An Introduction to Systematic Geomorphology*, Vol 4., ANU Press, Canberra.

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Sample data sheet for dune barrier study

TRANSECT STUDY: DUNES ATBeach

DATE:Group:.....

| Metres | 0 | 30 | 60 | 90 | 120 | 150 |
|--------------------------------------------------------|---|----|----|----|-----|-----|
| Weather | | | | | | |
| Ground temperature | | | | | | |
| Shade or sun? | | | | | | |
| Wind strength (Estimate strong, moderate, low, nil) | | | | | | |
| Wind direction (from _ to _) | | | | | | |
| pH of top sand layer | | | | | | |
| Bare sand % | | | | | | |
| Ground cover % (grass/creepers) | | | | | | |
| Bushes % | | | | | | |
| Trees % | | | | | | |
| Major species of vegetation | | | | | | |
| Minor vegetation | | | | | | |